

Remarks

Reconsideration of this Application is respectfully requested.

Claims 14, 18-22, 40, 43-46, 60, 63, 65, 67-70, 72, and 74-87 are pending in the application, with 14, 40, 63, 70, and 77 being the independent claims. Claims 1-13, 15-17, 23-39, 41, 42, 47-59, 61, 62, 64, 66, 71, and 73 were previously cancelled. Claims 40 and 43-46 were previously withdrawn from consideration. Applicants note that claims 14, 18-22, 60, 63, 65, 67-70, 72, and 74-87 were incorrectly listed in the Office Action Summary under Disposition of Claims, block 5, which identifies allowed claims, instead of under Disposition of Claims, block 6, which identifies rejected claims. Based on the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding rejections and that they be withdrawn.

Rejections under 35 U.S.C. § 103

In paragraph two of the Office Action, claims 14, 18-22, 60, 63, 65, 67-70, 72, and 74-87 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,717,252 to Nakashima et al. (hereinafter Nakashima) in view of U.S. Patent No. 5,583,377 to Higgins, III (hereinafter Higgins '377), U.S. Patent No. 5,291,062 to Higgins, III (hereinafter Higgins '062), and U.S. Patent No. 6,020,637 to Karnezos (hereinafter Karnezos). Applicants respectfully traverse the rejection.

Nakashima and Higgins '377

Applicants assert that a motivation to combine Nakashima and Higgins '377 is not present. Furthermore, Applicants assert that Nakashima and Higgins '377 actually teach away from their combination. Applicants note that the Manual of Patent Examining Procedure (MPEP) § 2141.02 states "[a] prior art reference must be

considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention."

First, Applicants assert that Nakashima teaches away from combination with elements of Higgins '377. For example, Nakashima states that "the device may be made thinner by depressing the metal substrate 4 downward to thereby lower the mounting position of the semiconductor chip 3...." (Col. 15, lines 63-65). Applicants assert that by combining elements of Higgins '377, in particular heat sink 22, with the BGA package illustrated in FIG. 21 of Nakashima could potentially make the BGA package thicker.

For example, if metal substrate 4 of Nakashima were depressed further so that a bottom surface of metal substrate 4 could be attached to a printed circuit board (PCB), the thickness of the BGA package could potentially increase and/or the manufacturability of the BGA package would become more difficult. The top surface of semiconductor chip 3 would be lowered (i.e., to a position flush with or below the top surface of metal substrate 4) making the BGA package thicker and/or more difficult to manufacture (e.g., it could be more difficult to connect bonding wire 7 to conductor pattern 1 without shorting bonding wire 7 to metal substrate 4). Thus there is no motivation to combine provided in Nakashima, and in fact, Nakashima teaches away from combination with Higgins '377.

Furthermore, as stated in a response filed at the U.S. Patent and Trademark Office on January 26, 2004, Nakashima describes that "a copper plate produced by forming nickel-plating layers on both surfaces is used as the metal substrate 4." (Col. 10, lines 46-48). Nickel-plating on copper is typically used in BGA packaging technology to prevent inter-metallic diffusion of other alloys or metals (e.g., solder or gold) into the

copper, and molten solder does not wet well on nickel-plated surfaces (i.e., to attach metal substrate 4 to a PCB). Thus, Nakashima teaches away from configuring a surface of metal substrate 4 to mount to a PCB, and therefore further teaches away from combination with Higgins '377.

Accordingly, Applicants assert that for at least these reasons, a motivation to combine Nakashima and Higgins '377 is not present, and instead, Nakashima teaches away from this combination.

Second, Applicants assert that Higgins '377 teaches away from combination with elements of Nakashima. For example, circuitized substrate 12 of Higgins '377 apparently does not require a metal substrate/stiffener for enhanced support and strengthening/stiffening functions (see FIG. 1). Furthermore, Higgins '377 describes that "[f]langes of the heat sink are attached or *supported by* a surface of the substrate." (Abstract, lines 5-7, emphasis added). Thus, there is no motivation to combine the metal substrate 4 of Nakashima with the heat sink 22 in device 10 of Higgins '377 for support purposes.

In fact, attaching metal substrate 4 of Nakashima to circuitized substrate 12 of Higgins '377 would make manufacturing device 10 of Higgins '377 more expensive and/or more difficult (e.g., more metal required; it would be more difficult to connect conductive wires 19 to conductive traces 14 because they would have to extend through openings through metal substrate 4). For example, Higgins '377 describes "that by keeping flanges 28 thin the profile or height of device 10 can also be kept small" and that another "reason for making flanges 28 thin is to reduce the possibility of electrically short-circuiting conductive wires 19 to the heat sink." (Col. 4, lines 45-49). Thus, attaching a metal substrate 4 of Nakashima to circuitized substrate 12 of Higgins '377

could make device 10 thicker and make routing of conductive wires 19 to conductive traces 14 more difficult.

Accordingly, Applicants assert that for at least these reasons, a motivation to combine Nakashima and Higgins '377 is not present, and instead, Higgins '377 teaches away from this combination.

Karnezos

Even assuming, *arguendo*, that Nakashima and Higgins '377 may be combined, a motivation to combine Karnezos with these references is not present. Karnezos relates to a die-down package configuration. Thus, Karnezos teaches away from combination with Nakashima (FIG. 21) and Higgins '377 (FIG. 1), which describe die-up BGA package configurations. For example, Karnezos has different electrical and thermal characteristics (e.g., different electrical and thermal paths) from Nakashima and Higgins '377, due to their differing die-down and die-up configurations.

Furthermore, Karnezos relates to a two-piece package cavity defined by a heat spreader 110 and ground plane 160 (FIG. 3A). Thus, Karnezos teaches away from combination with Nakashima (FIG. 21) and Higgins '377 (FIG. 1), which describe one-piece package cavities defined by metal substrate 4 and heat sink 22, respectively. For example, Karnezos states, "It should also be noted that the cost of the one-piece heat spreader of the prior art package of FIG. 2 leads to be significantly higher than the combined cost of the ground plane and heat spreader of the present invention." (Col. 5, lines 38-41).

Accordingly, Applicants assert that a motivation to combine Nakashima, Higgins '377, and Karnezos is not present.

Obviousness and Hindsight

"Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination." *In re Gorman*, 933 F.2d 982 (Fed. Cir. 1991) (quoting *In re Bond*, 910 F.2d 831, 834 (Fed. Cir. 1990). The Office Action states on page five:

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate elements a) and b) as taught by Higgins, III ('377 and '062 patents) and Karnezos respectively so that an external connection capability, interconnect density, power/ground routing and thermal dissipation can be improved in Nakashima et al's BGA package.

Applicants assert that this statement of the Office Action does not clearly provide a suggestion of the desirability of doing what the inventors have done. M.P.E.P § 2143 states:

The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

Applicants assert that such a suggestion has not been clearly provided, but instead a mere conclusion has been provided. Applicants note "it is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious" *In re Fritch*, 972

F.2d 1260 (Fed. Cir. 1992). Thus, Applicants respectfully request that suggestion be provided, presenting a convincing line of reasoning, or that the claims be passed to allowance.

Disposition of Pending Claims

For at least the reasons provided above, Applicants assert that independent claims 14, 63, 70, and 77 are patentable over Nakashima, Higgins '377, Karnezos, and Higgins '062. Thus, claims 18-22, 60, 80, and 81, which depend from claim 14, claims 65, 67-69, 82, and 83, which depend from claim 63, claims 72, 74-76, 84, and 85, which depend from claim 70, and claims 78, 79, 86, and 87, which depend from claim 77, are also patentable over Nakashima, Higgins '377, Karnezos, and Higgins '062 for at least these reasons, and further in view of their own features.

Applicants therefore request that the Examiner withdraw the rejection of claims 14, 18-22, 60, 63, 65, 67-70, 72, and 74-87.

Conclusion

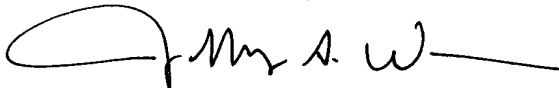
All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the

undersigned at the number provided. Prompt and favorable consideration of this Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

A handwritten signature in dark ink, appearing to read "Jeffrey S. Weaver", with a large, stylized initial "J" and a long horizontal flourish extending to the right.

Jeffrey S. Weaver
Attorney for Applicants
Registration No. 45,608

Date: 7-16-04

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600